Study Guide

MPH-511: Principles of Epidemiology and Public Health

Institution	University of Nicosia		
Programme of Study	Master of Public Health		
Module	MPH-511: Principles of Epidemiology and Public Health		
Level	Undergraduate ☐	Postgraduate (Master) ☒	
Language of Instruction	English		
Mode of Delivery?	Distance Learning ☒	Conventional ☐	
Type of Course	Required ☒	Elective ☐	
Number of Group Advising Meetings/Teleconferences/Lectures	Total: 55	With Physical Presence 0	On-line: 55
Assessment	• Participation • Assignments • Exams		
Number of ECTS credits	10		

Preparation of Study Guide by:	
Review and approval of study Guide by:	

i. Teaching Faculty
Dr Elena Critselis (Course Lead), Dr Christiana Demetriou (Contributor)
ii. Course:

Brief description of Course and Aims

This course aims to cover in depth the core principles of Epidemiology and Public Health and the methodologies for studying the frequency, distribution, and determinants of disease in populations, as well as the fundamentals of disease prevention and monitoring at the national and international levels. The main objectives of the course are to:

- Apply measures of descriptive and analytic epidemiology used to assess the frequency, distribution and determinants of disease in human populations.
- Apply the different study designs in epidemiological research and be able to design their own epidemiological studies for answering research questions relevant to Public Health.
- Differentiate between association and causation, as well as critically evaluate the importance of their distinction in Public Health Policy
- Critically evaluate concepts pertaining to internal study validity (random error, bias, confounding) and external study validity (generalizability)
- Explain the importance of systematic reviews and meta-analyses in Public Health and be able to interpret these for answering research questions relevant to Public Health.
- Apply the different levels of prevention and be able to design their own preventive measures for tackling current Public Health challenges.
- Demonstrate deep understanding of the aims, objectives, and responsibilities of the World Health Organization and its leadership priorities, as well as the health-related UN Sustainable Development Goals

Expected Learning Outcomes

- Describe the importance of Epidemiology and Public Health for ensuring disease prevention, wellbeing, and prosperity in populations.
- Calculate, interpret, and apply appropriate major measures of disease frequency (e.g. prevalence, incidence, rate, and attack rate) in a relevant scenario.
- Calculate, interpret, and apply appropriate major measures of mortality (e.g. crude, cause-specific, age-specific, perinatal, case-fatality rate, and standardized mortality ratio) in a relevant scenario.
- Relate and apply the major concepts involved in analytic epidemiology, such as exposure/predictor, outcome/response, association, determinant, risk factor, and protective factor.
- Calculate, interpret, and apply appropriate measures of association pertaining to the analysis of binary and numeric outcomes (Odds Ratio, Relative Risk, Regression coefficient and mean difference) in relevant Epidemiology and Public Health research scenaria.
- Calculate, interpret, and apply appropriate measures of impact (i.e. Attributable Risk, Population Attributable Risk, and Population Attributable Risk Fraction) in relevant Epidemiology and Public Health research scenaria.
- Critically evaluate the major Observational Epidemiological study designs (e.g. ecological, cross-sectional, case-control, and cohort study designs) and design a suitable study for answering specific research questions of Public Health importance.

- Critically evaluate the major Interventional Epidemiological study designs (e.g. Randomized Controlled Trials and other non-randomized trials) and design a suitable study for answering specific research questions of Public Health importance.
- Critically evaluate concepts relating to sampling, estimation, and statistical inference, such as parameters vs. estimates, and statistical significance.
- Critically appraise the different sampling methods used in Epidemiological research, and design their own sampling strategy for a given research scenario.
- Critically appraise how different types of selection bias could affect the validity of different study designs, and articulate strategies to avoid these.
- Critically appraise how different types of information bias could affect the validity of different study designs, and articulate strategies to avoid these.
- Calculate, interpret and critically appraise results on sensitivity, specificity, positive and negative predictive value in published literature.
- Critically appraise how the multifactorial nature of disease and the concept of confounding could affect the validity of research findings and evaluate strategies to detect and deal with it in published research studies.
- Differentiate the concepts of confounding, effect modification (interaction) and effect mediation, and critically appraise such results from the published literature.
- Compare, contrast and differentiate the concept of external study validity (generalizability) from internal study validity, critically evaluating and explaining its importance in Public Health Policy.
- Perform and evaluate systematic reviews, as well as interpret the results from meta-analyses (forest plots) for answering specific research questions relevant to Public Health.
- Distinguish and describe the differences between association and causation and critically appraise criteria for inferring causality for a given association.
- Critically evaluate how social and environmental determinants (poverty, food/water availability, climate change, armed conflict) can impact on health and health inequalities, evaluate how social determinants can make individuals and communities more vulnerable to climate-related health threats and articulate the importance of the concept of environmental justice.
- Evaluate and apply the different levels of disease prevention (primary, secondary, tertiary) for tackling current Public Health challenges.
- Compare and contrast the different routine notification and registration systems for vital statistics and specific diseases and the importance of disease registers.
- Analyse the structure, organization, responsibilities and priorities of the World Health Organization (WHO), including its leadership priorities and the public health-related UN Millennium Development Goals and Sustainable Development Goals.

Teaching Material
- Weekly PowerPoint presentations
- Bibliography
  - Required

Title	Author(s)	Publisher	Year	ISBN
Gordis Epidemiology 6th Edition	de David D Celentano ScD	Elsevier	2018	032355 2293

Title	Author(s)	Publisher	Year	ISBN
	MHS, Moyses Szklo MD			
Modern Epidemiology (4th Edition)	Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman	LWW	2021	145119 3289

- Recommended

Title	Author(s)	Publisher	Year	ISBN
Oxford Handbook of Public Health Practice (4th Edition)	Ichiro Kawachi (Editor), Iain Lang (Editor), Walter Ricciardi (Editor)	Oxford University Press	2020	019880 0126
Issues in Public Health (3rd ed.)	McKee M.	Open University Press	2022	033524 9159

ECTS Credits				
Compulsory module corresponding to 10 ECTS.				
iii. **Each Main Topic/Thematic Area:**				
The details for each topic are provided in the respective week that follows in the given study guide.				
iv. **Teaching Timetable**				
Week	**Topic & objective**	**Readings**	**Study Hours required**	**Assessed work & WebEx meetings**
1	• Describe the importance of Epidemiology and Public Health for ensuring disease prevention, wellbeing, and prosperity in populations. • Calculate, interpret, and apply appropriate major measures of disease frequency (e.g. prevalence, incidence, rate, and attack rate) in a relevant scenario. • Calculate, interpret, and apply appropriate major measures of mortality	• Welcome Video • PPT presentation (Introduction to Epidemiology and Public Health) •PPT presentation (Measures of Disease Frequency) •PPT presentation (Measures of Mortality)	15 hours	• Wiki: What is Public Health and Epidemiology? •Q&A Forum (**Mandatory Activity:** Calculating and reporting prevalence, incidence and rates)

	(e.g. crude, cause-specific, age-specific, perinatal, case-fatality rate, and standardized mortality ratio) in a relevant scenario.				
2	• Relate and apply the major concepts involved in analytic epidemiology, such as exposure/predictor, outcome/response, association, determinant, risk factor, and protective factor. • Calculate, interpret, and apply appropriate measures of association pertaining to the analysis of binary and numeric outcomes (Odds Ratio, Relative Risk, Regression coefficient	• PPT presentation (Measures of association with binary outcomes I: Relative Risk) • PPT presentation (Measures of association with binary outcomes II: Odds Ratio) • PPT presentation (Measures of association with numeric outcomes I) • PPT presentation (Measures of association with numeric outcomes II)	15 hours	• Webinar (Measures of association applied to real case scenarios) • Q&A Forum (**Mandatory Activity:** Calculating and reporting Relative Risks and Odds Ratios) • Q&A Forum (Determining associations with numeric outcomes)	

		and mean difference) in relevant Epidemiology and Public Health research scenaria.			
3		• Calculate, interpret, and apply appropriate measures of impact (i.e. Attributable Risk, Population Attributable Risk, and Population Attributable Risk Fraction) in relevant Epidemiology and Public Health research scenaria.	• PPT presentation (Measures of population impact)	15 hours	• Q&A Forum (Measures of impact applied to real case scenarios)

4	• Critically evaluate the major Observational Epidemiological study designs (e.g. ecological, cross-sectional, case-control, and cohort study designs) and design a suitable study for answering specific research questions of Public Health importance.	• PPT presentation (Observational study designs)	15 hours	• Q&A Forum (Examples of observational study designs from the literature) • Q&A Forum (Judging on the type of observational study design)	
5	• Critically evaluate the major Interventional Epidemiological study designs (e.g. Randomized Controlled Trials and other non-randomized trials) and design a suitable study for answering specific research questions of Public Health importance.	• PPT presentation (Design of Interventional Study Designs: Randomized and Non-randomized trials)	15 hours & 10 hours Assignment Preparation	• Q&A Forum (Judging on the type of interventional study design) • Online Chat (Interventional study designs: Randomized Controlled Trials and other non-randomized trials)	

6	• Critically evaluate concepts relating to sampling, estimation, and statistical inference, such as parameters vs. estimates, and statistical significance.	• PPT presentation (Sampling and the Random Error) • PPT presentation (Introduction to Statistical Inference I) • PPT presentation (Introduction to Statistical Inference II)	15 hours	• Q&A Forum (Identifying associations and judging on statistical significance) • Webinar (Determining statistical significance in the literature	
7	• Critically appraise the different sampling methods used in Epidemiological research, and design their own sampling strategy for a given research scenario. • Critically appraise how different types of selection bias could affect the validity of different study designs, and articulate strategies to avoid these.	• PPT presentation (Overview of sampling methods) • PPT presentation (Selection bias) • PPT presentation (Information bias) • PPT presentation (Sensitivity and specificity of screening and diagnostic tools	15 hours	• Q&A Forum **Mandatory Activity:** (Identifying the presence of selection bias in research studies) • Q&A Forum (Sampling methods and selection bias) • Q&A Forum (Judging on the presence of information bias)	

	• Critically appraise how different types of information bias could affect the validity of different study designs, and articulate strategies to avoid these. • Calculate, interpret and critically appraise results on sensitivity, specificity, positive and negative predictive value in published literature.				
8	• Critically appraise how the multifactorial nature of disease and the concept of confounding could affect the validity of research findings and evaluate strategies to detect and deal with it in published	• PPT presentation (Introduction to Confounding: multifactorial nature of disease) • PPT presentation (Dealing with Confounding: crude and adjusted estimates) • PPT presentation (Effect	15 hours	• Q&A Forum (Judging on the presence of confounding and effect modification in associations) • Webinar (**Mandatory Activity:** Interpreting crude and adjusted estimates from the literature)	

		research studies. • Differentiate the concepts of confounding, effect modification (interaction) and effect mediation, and critically appraise such results from the published literature.	modification and effect mediation)			
9	• Compare, contrast and differentiate the concept of external study validity (generalizability) from internal study validity, critically evaluating and explaining its importance in Public Health Policy. • Perform and evaluate systematic reviews, as well as interpret the results from meta-analyses (forest plots) for answering specific	• PPT presentation (Internal and External study validity) • PPT presentation (Interpreting results from systematic reviews and meta-analyses)	15 hours & 10 hours Assignment Preparation	• Webinar (Systematically searching for systematic reviews and meta-analysis in the literature • Q&A Forum (Judging on internal and external study validity)	

	research questions relevant to Public Health.			
10	• Distinguish and describe the differences between association and causation and critically appraise criteria for inferring causality for a given association.	• PPT presentation (Causality in research: association vs causation)	15 hours	• Discussion Forum (Critical evaluation of causality of published associations in the literature) • Q&A Forum (Judging on causality for a given association)
11	• Critically evaluate how social and environmental determinants (poverty, food/water availability, climate change, armed conflict) can impact on health and health inequalities, evaluate how social determinants can make	• PPT presentation (The wider determinants of health)	15 hours	• Webinar (Wider determinants of health, vulnerability to climate-related health threats and environmental justice)

	individuals and communities more vulnerable to climate-related health threats and articulate the importance of the concept of environmental justice.			
12	• 20. Evaluate and apply the different levels of disease prevention (primary, secondary, tertiary) for tackling current Public Health challenges.	• PPT presentation (Principles of disease prevention)	15 hours	• Webinar (Important considerations for the choice of an appropriate preventive programme at all levels • Wiki (**Mandatory Activity:** Devising efficient and cost-effective preventive programmes)

13	• Compare and contrast the different routine notification and registration systems for vital statistics and specific diseases and the importance of disease registers. • 22. Analyse the structure, organization, responsibilities and priorities of the World Health Organization (WHO), including its leadership priorities and the public health-related UN Millennium Development Goals and Sustainable Development Goals.	• PPT presentation (Global Health Monitoring and Public Health Surveillance)	15 hours	
14	• n/a (student revision for exams)	• n/a	30 hours	• n/a

Teaching material including PowerPoint presentations with extended descriptions and explanations, asynchronous video presentations, additional readings (journal articles and e-books), access to additional videos and commercials related to the module, synchronous meetings (WebEx), forums, chats, quizzes, case studies and other formative and summative assessments.

vi.   Written work – Exams – Assessment
This course is assessed via a combination of summative assignments and exams. **Written Exams** **Final Exam:** Students are expected to undertake a written final examination. Final examinations will be completed online using electronic invigilation software.
vii.   Communication
The following opportunities for communication are provided to students in an attempt to enhance interaction between i. Student and faculty, ii. Student and student iii. Student and content: • Webinars • Q&A discussion forums and chats • Wikis • Email • MS Teams

DEPARTMENT OF PRIMARY CARE AND POPULATION HEALTH

MASTER OF PUBLIC HEALTH (MPH)

Study Guide

MPH-511: Principles of Epidemiology and Public Health

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Course Contributor:

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Contents

Introductory note

This Study Guide is a basic supplement for the distance learning course MPH-511 'Principles of Epidemiology and Public Health', which is offered by the distance learning Master of Public Health (MPH) programme. The broad objective of the course is to cover in depth the core principles of Epidemiology and Public Health and the methodologies for studying the frequency, distribution, and determinants of disease in populations, as well as the fundamentals of disease prevention and monitoring at a national and international level.

The aim of this Guide is to direct the students and help them into making systematic use of the educational material on which the teaching of the course is based. The Guide must be used in common with the Course Outline and with the educational material (recorded lectures, online tutorials, exercises, articles, and book chapters), as indicated for each section in the interactive e-Learning Platform of the course (Moodle). Students are advised to start their studying by the recorded course lecture for each topic, in order to take full benefit of the additional activities as listed in the current Guide and described in detail on the Moodle page of the course.

The current course includes **15 sections**. The course material will be made available on Moodle over a duration of **14 weeks,** including **1 study week** at the end of the semester. Each of these sections represents a core course topic and is composed of the following components:

- Learning Objectives and Outcomes
- Teaching Material
- Additional learning activities to complete
- Additional Support Material
- Key words

At the beginning of each study week, students are expected to familiarise themselves with the corresponding sections' objectives and learning outcomes, while they should go through the **teaching material** (recorded lectures) and conduct the **additional learning activities**.

Learning activities will have a designated start and end date and time, which will be communicated to students via email. Some activities will be synchronous (e.g. webinars, online chats), while others will be asynchronous (e.g. Q&A Fora). The former will involve direct live interaction (either chat or verbal/video) between students and tutor, as well as between students themselves (student-tutor or student-student interactions), while in the latter the aforementioned interactions will not be live. More details on learning activities are provided on Moodle (orientation week). Going through the teaching material and conducting the learning activities is essential, since it will help in clarifying and assimilating the material of the course as well as developing critical thinking on each topic.

In addition to the essential components described above, each section contains **additional support material,** comprised of relevant bibliography (namely relevant textbooks and designated chapters), as well as relevant online resources (i.e. websites and other documents such as scientific articles) and online videos to watch. Additional support material found on Moodle is recommended for acquiring more in-depth knowledge of the relevant concepts, however these are not essential for addressing the section Learning Outcomes, nor for the relevant assessment. Students are strongly encouraged to go through these additional resources, as part of self-directed learning, which will facilitate deeper understanding and critical thinking on the topic of interest. The relevant online resources and videos could be updated and/or enriched during the semester.

All relevant resources and activities can be found on the Moodle page of the specific course. It is essential that you follow the specific Study Guide in combination with the course's Moodle page throughout the duration of the course, in order to organise your learning time efficiently and take full advantage of the learning material offered.

You will have the opportunity to revise the course material at the end of the Semester, during the examination period.

Course Weekly Schedule

Week 1	
Section 1	Introduction to Epidemiology and Public Health
Section 2	Measures of disease frequency and mortality in chronic and infectious disease epidemiology
Week 2	
Section 3	Measures of Association
Week 3	
Section 4	Measures of Impact
Week 4	
Section 5	Observational study designs: Cross-sectional, Prospective, Retrospective
Week 5	
Section 6	Interventional study designs: Randomized Controlled Trials and other non-randomized trials
Week 6	
Section 7	Sampling, random error and statistical inference
Week 7	
Section 8	Systematic error in research I: selection bias
Section 9	Systematic error in research II: Information bias (measurement error)
Week 8	
Section 10	Multi-factorial nature of disease: confounding, effect modification, and effect mediation
Week 9	
Section 11	External study validity and the importance of systematic reviews and meta-analyses
Week 10	
Section 12	Association vs. Causation
Week 11	
Section 13	The Wider Determinants of Health
Week 12	
Section 14	Principles of disease prevention
Week 13	
Section 15	Global Health Monitoring and Public Health Surveillance
Week 14	
Study Week	

Section 1 – Introduction to Epidemiology and Public Health

Learning Objectives and Outcomes

Objectives

The specific section aims to introduce and analyse the concepts of Epidemiology and Public Health and highlight their importance for ensuring disease prevention, wellbeing and prosperity in populations.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Describe the importance of Epidemiology and Public Health for ensuring disease prevention, wellbeing, and prosperity in populations.

Teaching Material

Recorded Lectures

- Welcome video by Course Lead (introduction to the Course, outline of course objectives, introduction to the course lecturers)
- Recorded PowerPoint presentation (Introduction to Epidemiology and Public Health)

Additional learning activities to complete

- Wiki: What is Public Health and Epidemiology?

  Description: Students will be required to collectively build an essay on "What is Public Health & Epidemiology?" Students can use knowledge from the section but are also encouraged to approach the question from their point of view, contributing to the written discussion what Public Health and Epidemiology means to them (or for their profession). Students can interact with each other in this written discourse, disagreeing with, advancing and commenting on each other's ideas.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapter 1.
- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapter 1.

Websites and Other relevant resources

- CDC - Public Health 101 (Introduction to Public Health) (https://www.cdc.gov/publichealth101/public-health.html)
- CDC - Public Health 101 (Introduction to Epidemiology) (https://www.cdc.gov/publichealth101/epidemiology.html)
- CDC Self-Study Course SS1978 - Lesson 1: Introduction to Epidemiology (https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/index.html)
- The UK's Faculty of Public Health - What is Public Health (http://www.fph.org.uk/what_is_public_health)
- BMJ – What is Epidemiology? (http://www.bmj.com/about-bmj/resources-readers/publications/epidemiology-uninitiated/1-what-epidemiology
- The role of the WHO in Public Health (http://www.who.int/about/role/en/)
- WHO Global Health Workforce Network (http://www.who.int/hrh/network/en/)
- WHO Europe – Health2020 (http://www.euro.who.int/en/health-topics/health-policy/health-2020-the-european-policy-for-health-and-well-being)
- Centers for Disease Control and Prevention (CDC) (https://www.cdc.gov/)
- European Centre for Disease Prevention and Control (ECDC) (https://ecdc.europa.eu/en)
- Public Health England (https://www.gov.uk/government/organisations/public-health-england)
- European Public Health Association (EUPHEA) https://eupha.org/)
- American Public Health Association (APHA) – (https://www.apha.org/policies-and-advocacy/advocacy-for-public-health/priorities)
- World Federation of Public Health Associations (https://www.wfpha.org/)

Online videos

- Online video (Public Health Wessex Training Group - What is Public Health?)

- Online video (WHO - Public health in the 21st century)

- Online video (CDC - Introduction to Public Health)

- Online video (The birth of modern Epidemiology and Public Health I: John Snow and the London Cholera Epidemic)

- Online video (The birth of modern Epidemiology and Public Health II: Edward Jenner and the first ever vaccine)

Expected study time: 5.5 hours

Key words

Epidemiology, Public Health, Introduction.

Section 2 – Measures of disease frequency and mortality in chronic and infectious disease epidemiology

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail measures of descriptive epidemiology used to assess the frequency and distribution of disease and mortality in human populations.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Calculate, interpret, and apply appropriate major measures of disease frequency (e.g. prevalence, incidence, rate, and attack rate) in a relevant scenario.
2. Calculate, interpret, and apply appropriate major measures of mortality (e.g. crude, cause-specific, age-specific, perinatal, case-fatality rate, and standardized mortality ratio) in a relevant scenario.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Measures of Disease Frequency)
- Recorded PowerPoint presentation (Measures of Mortality)

Additional learning activities to complete

- Q&A Forum (**Mandatory Activity:** Calculating and reporting prevalence, incidence and rates)

  Description: Students are asked to use the section's material to attempt a series of tasks relating to calculating measures of disease frequency. Students are expected to attempt to calculate and to interpret measures of frequency. Furthermore, in order to perform

all tasks correctly, students are expected to display critical thinking as to which frequency measures are best to be used depending on the task scenario.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition)*. 2018. Chapters 3 and 4.

- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapter 4.

Websites and Other relevant resources

- CDC - Public Health 101 (Introduction to Epidemiology) (https://www.cdc.gov/publichealth101/epidemiology.html)

- CDC Self-Study Course SS1978: Lesson 1 (Introduction to Epidemiology) - Section 6 (https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/section6.html)

- CDC Self-Study Course SS1978: Lesson 3 (Measures of Risk) - Sections 1-3 (https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson3/index.html)

- IARC - Cancer Epidemiology: Principles and Methods (http://publications.iarc.fr/Non-Series-Publications/Other-Non-Series-Publications/Cancer-Epidemiology-Principles-And-Methods-1999) Chapter 4 - Measures of occurrence of disease and other health-related events

- Field Epidemiology Manual - Attack rates and case fatality (https://wiki.ecdc.europa.eu/fem/w/wiki/attack-rates-and-case-fatality)

- WHO Mortality Database (http://www.who.int/healthinfo/mortality_data/en/)

- WHO - Adult mortality (http://www.who.int/gho/mortality_burden_disease/mortality_adult/en/)

- WHO - Infant mortality (http://www.who.int/gho/child_health/mortality/neonatal_infant_text/en/)

- WHO - Under-5 mortality (http://www.who.int/mediacentre/factsheets/fs178/en/)

Online Videos

- Online video (Maastricht University - Measures of disease frequency)

Expected study time: 5.5 hours

Key words

Measures of Disease Frequency, Measures of Mortality, Prevalence, Incidence, Rate, Attack Rate, Mortality Rate.

Section 3 – Measures of Association

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail measures of analytic epidemiology used to assess the determinants of disease and other health-related conditions in human populations.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Relate and apply the major concepts involved in analytic epidemiology, such as exposure/predictor, outcome/response, association, determinant, risk factor, and protective factor.
2. Calculate, interpret, and apply appropriate measures of association pertaining to the analysis of binary and numeric outcomes (Odds Ratio, Relative Risk, Regression coefficient and mean difference) in relevant Epidemiology and Public Health research scenario.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Measures of association with binary outcomes I: Relative Risk)
- Recorded PowerPoint presentation (Measures of association with binary outcomes II: Odds Ratio)
- Recorded PowerPoint presentation (Measures of association with numeric outcomes I)
- Recorded PowerPoint presentation (Measures of association with numeric outcomes II)

Additional learning activities to complete

- Webinar (Measures of association applied to real case scenarios)

Description: Students are required to apply the knowledge gained from the section's material on real life case and research scenaria. Students will be expected to approach problem solving with critical thinking so as to choose the most appropriate measures of association for different research scenaria, to calculate these where appropriate and to correctly interpret them.

- Q&A Forum (**Mandatory Activity:** Calculating and reporting Relative Risks and Odds Ratios)

  Description: Students are asked to use the section's material to attempt a series of tasks relating to calculating measures of association. Students are expected to attempt to calculate and to interpret measures of association. Furthermore, in order to perform all tasks correctly, students are expected to display critical thinking as to which measure of association is best to be used depending on the task scenario. All questions are based on real life research questions.

- Q&A Forum (Determining associations with numeric outcomes)

  Description: Students are asked to use the section's material to attempt a series of tasks relating to calculating measures of association for numeric outcomes. Students are expected to attempt to calculate and to interpret measures of association for numeric outcomes. All questions are based on real life research questions.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapter 12

- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapter 5.

Websites and Other relevant resources

- CDC - Public Health 101 (Introduction to Epidemiology) (https://www.cdc.gov/publichealth101/epidemiology.html)

- CDC Self-Study Course SS1978: Lesson 3 (Measures of Risk) - Section 5 (https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson3/index.html)

- Schmidt CO, Kohlmann T, Risk quantification in epidemiologic studies, *Int J Public Health*. 2008;53(2):118-9.

- Schmidt CO, Kohlmann T, When to use the odds ratio or the relative risk?, *Int J Public Health*. 2008;53(3):165-7.

- Whitley E and Jonathan B, Statistics review 5: Comparison of means, *Crit Care*. 2002; 6(5): 424–428. (https://ccforum.biomedcentral.com/articles/10.1186/cc1548)

- The BMJ – Correlation and Regression (http://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one/11-correlation-and-regression)

- BMJ Endgames - Correlation versus linear regression (http://www.bmj.com/content/346/bmj.f2686)

Online videos

- Online video (National Collaborating Centre for Methods and Tools - Relative Risk it's easy to calculate and interpret)

- Online video (National Collaborating Centre for Methods and Tools - How to Calculate an Odds Ratio)

Expected study time: 11 hours

Key words

Measures of Association, Risk Ratio, Rate Ratio, Relative Risk, Odds Ratio, Regression Coefficient, Correlation Coefficient, Mean Difference.

Section 4 – Measures of Impact

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail measures of analytic epidemiology used to assess the impact of specific determinants on population health.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Demonstrate deep understanding on the major measures of impact used in Epidemiology and Public Health research (Attributable Risk, Population Attributable Risk, Population Attributable Risk Fraction) and be able to calculate, interpret, and apply them in a relevant scenario.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Measures of population impact)

Additional learning activities to complete

- Q&A Forum (Measures of impact applied to real case scenarios)

  Description: Students are asked to use the section's material to attempt a series of tasks relating to calculating measures of impact. Students are expected to attempt to calculate and to interpret measures of association for numeric outcomes. Students are also expected to display critical thinking as to which measure of impact is best to be used depending on the task scenario. All questions are based on real life research questions.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapter 2 and 4.

- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapter 5.

Websites and Other relevant resources

- WHO - Metrics: Population Attributable Fraction (PAF) (http://www.who.int/healthinfo/global_burden_disease/metrics_paf/en/)
- HealthKnowledge - Measures of the effect of an exposure (https://www.healthknowledge.org.uk/e-learning/epidemiology/specialists/measures-effect-exposure)
- The Young Epidemiology Scholars Program (YES) - Attributable Risk Applications in Epidemiology (http://www.collegeboard.com/prod_downloads/yes/4297_MODULE_17.pdf)
- Eide GE, Heuch I. Average attributable fractions: a coherent theory for apportioning excess risk to individual risk factors and subpopulations. *Biom J.* 2006;48(5):820-37. (https://www.ncbi.nlm.nih.gov/pubmed/17094346)
- Darrow LA, Steenland NK. Confounding and bias in the attributable fraction. Epidemiology. 2011;22(1):53-8. (https://www.ncbi.nlm.nih.gov/pubmed/20975564)
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- WHO - Global health risks: mortality and burden of disease attributable to selected major risks. (http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf)

Online videos

- Online video (International Journal of Clinical Practice - The Population Attributable Fraction and Confounding: Buyer Beware)

Expected study time: 11 hours

Key words

Measures of Impact, Attributable Risk, Population Attributable Risk, Population Attributable Risk Fraction.

Section 5 – Observational study designs: Cross-sectional, Prospective, Retrospective

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail the common observational study designs used in Epidemiology and Public Health research and equip students with the skills to design their own epidemiological studies.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Critically evaluate the major Observational Epidemiological study designs (e.g. ecological, cross-sectional, case-control, and cohort study designs) and design a suitable study for answering specific research questions of Public Health importance.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Observational study designs)

Additional learning activities to complete

- Q&A Forum (Examples of observational study designs from the literature)
  Description: Students are presented with known epidemiological studies and are asked to identify the study designs of these known epidemiological studies. This activity builds students' skills of identifying observational study designs (and hence their advantages and disadvantages) when reading published literature.

- Q&A Forum (Judging on the type of observational study design)
  Description: Students are presented with real life epidemiological questions and are asked to identify the best observational study design to address them. Students are expected to demonstrate critical thinking in identifying the advantages and disadvantages of different study designs.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition)*. 2018. Chapters 7-9.

- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapters 7 and 8.

Websites and Other relevant resources

- CDC - Public Health 101 (Introduction to Epidemiology) (https://www.cdc.gov/publichealth101/epidemiology.html)

- CDC Self-Study Course SS1978: Lesson 1 (Introduction to Epidemiology) - Section 7 (https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/section7.html)

- Centre for Evidence Based Medicine - Study Designs (http://www.cebm.net/study-designs/)

- Jeremy Howick, Introduction to Study Design (http://www.cebm.net/wp-content/uploads/2014/06/CEBM-study-design-april-2013.pdf)

- IARC - Cancer Epidemiology: Principles and Methods (http://publications.iarc.fr/Non-Series-Publications/Other-Non-Series-Publications/Cancer-Epidemiology-Principles-And-Methods-1999) Chapter 5 - Overview of study designs

- BMJ - Epidemiology for the uninitiated, Chapter 6. Ecological studies (http://www.bmj.com/about-bmj/resources-readers/publications/epidemiology-uninitiated/6-ecological-studies)

- BMJ - Epidemiology for the uninitiated, Chapter 7. Longitudinal studies (http://www.bmj.com/about-bmj/resources-readers/publications/epidemiology-uninitiated/7-longitudinal-studies)

- BMJ - Epidemiology for the uninitiated, Chapter 8. Case-control and cross sectional studies (http://www.bmj.com/about-bmj/resources-readers/publications/epidemiology-uninitiated/8-case-control-and-cross-sectional)

- Grimes DA, Schulz KF. An overview of clinical research: The lay of the land. *Lancet,* 2002; 359:57-61. (https://www.ncbi.nlm.nih.gov/pubmed/11809203)

- Grimes DA, Schulz KF. Descriptive studies: What they can and cannot do. *Lancet,* 2002; 359:145-9. (http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(02)07373-7.pdf)

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- Oxford Centre for Evidence-based Medicine – Levels of Evidence (http://www.cebm.net/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/)

Expected study time: 11 hours

Key words

Observational Epidemiological Study Designs, Ecological, Case-control, Cohort, Cross-sectional.

Section 6 – Interventional study designs: Randomized Controlled Trials and other non-randomized trials

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail the common interventional study designs used in Epidemiology and Public Health research and equip students with the skills to design their own epidemiological studies.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Critically evaluate the major Interventional Epidemiological study designs (e.g. Randomized Controlled Trials and other non-randomized trials) and design a suitable study for answering specific research questions of Public Health importance.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Design of Interventional Study Designs: Randomized and Non-randomized trials)

Additional learning activities to complete

- Q&A Forum (Judging on the type of interventional study design)

  Description: Students are presented with real life epidemiological questions and are asked to identify the best interventional study design to address them. Students are expected to demonstrate critical thinking in identifying the advantages and disadvantages of different study designs.

- Online Chat (Interventional study designs: Randomized Controlled Trials and other non-randomized trials)

  Description: Students are presented with recent interventional studies, covering a variety of public health topics, and are asked to identify the study designs of these

known epidemiological studies. This activity builds students' skills of identifying interventional study designs and to display critical thinking in identifying their advantages and disadvantages.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapter 10 and 11.

Websites and Other relevant resources

- CDC - Public Health 101 (Introduction to Epidemiology) (https://www.cdc.gov/publichealth101/epidemiology.html)
- CDC Self-Study Course SS1978: Lesson 1 (Introduction to Epidemiology) - Section 7 (https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/section7.html)
- Centre for Evidence Based Medicine - Study Designs (http://www.cebm.net/study-designs/)
- Jeremy Howick, Introduction to Study Design (http://www.cebm.net/wp-content/uploads/2014/06/CEBM-study-design-april-2013.pdf)
- IARC - Cancer Epidemiology: Principles and Methods (http://publications.iarc.fr/Non-Series-Publications/Other-Non-Series-Publications/Cancer-Epidemiology-Principles-And-Methods-1999) Chapter 5 - Overview of study designs
- Grimes DA, Schulz KF. An overview of clinical research: The lay of the land. *Lancet,* 2002; 359:57-61. (https://www.ncbi.nlm.nih.gov/pubmed/11809203)
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- NIH - Clinical Trials (https://www.ncbi.nlm.nih.gov/pubmedhealth/PMHT0022681/)
- Oxford Centre for Evidence-based Medicine – Levels of Evidence (http://www.cebm.net/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/)

Online videos

- Online Video (UNICEF Innocenti - Randomized Controlled Trials)

Expected study time: 11 hours

Key words

Interventional Epidemiological Study Designs, Randomized Controlled Trial, Clinical Trial.

Section 7 – Sampling, random error and statistical inference

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail, as well as enable critical thinking on concepts pertaining to random error and statistical significance.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Critically evaluate concepts relating to sampling, estimation, and statistical inference, such as parameters vs. estimates, and statistical significance.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Sampling and the Random Error)
- Recorded PowerPoint presentation (Introduction to Statistical Inference I)
- Recorded PowerPoint presentation (Introduction to Statistical Inference II)

Additional learning activities to complete

- Q&A Forum (Identifying associations and judging on statistical significance)
  Description: This activity exposes students to the results of epidemiological associations and asks them to think in statistical terms about the statistical significance of presented results and the appropriate conclusions that can be drawn based on these results. Students are also expected to display critical thinking in drawing conclusions regarding the strength of statistically significant associations.

- Webinar (Determining statistical significance in the literature)
  Description: During this webinar students will review the main principles of statistical significance testing and then they will be presented with results from published literature (figures and tables) and will be asked to interpret whether the results

presented are statistically significant or not. This activity will cultivate students' skills of identifying statistically significant associations in the literature.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapters 7-10.

Websites and Other relevant resources

- CDC Self-Study Course SS1978: Lesson 2 (Measures of Spread) - Section 7 (https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson2/section7.html)
- Field Epidemiology Manual - The idea of Statistical Inference (https://wiki.ecdc.europa.eu/fem/w/wiki/the-idea-of-statistical-inference)
- The BMJ – Populations and Samples (http://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one/3-populations-and-samples)

Expected study time: 11 hours

Key words

Random error, Chance, Statistical inference, Statistical significance, Estimates.

Section 8 – Systematic error in research I: selection bias

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail, as well as enable critical thinking on concepts pertaining to sampling and selection bias.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Critically appraise the different sampling methods used in Epidemiological research, and design their own sampling strategy for a given research scenario.
2. Critically appraise how different types of selection bias could affect the validity of different study designs, and articulate strategies to avoid these.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Overview of sampling methods)
- Recorded PowerPoint presentation (Selection bias)

Additional learning activities to complete

- Q&A Forum (**Mandatory Activity:** Identifying the presence of selection bias in research studies)
  Description: Students are exposed to real-life examples of epidemiological studies and are asked to display critical thinking in identifying whether the sampling methods used in these studies could potentially contribute to selection bias, thus compromising study results.
- Q&A Forum (Sampling methods and selection bias)

Description: Students are presented with real-life examples of epidemiological studies and are asked to display critical thinking in identifying the sampling methods used in these studies and the advantages and disadvantages of different sampling methods in different

research scenaria. This activity aims to expose students to the complexities of choosing appropriate yet feasible sampling methods.

Additional Support Material

Bibliography

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- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapter 14.

Websites and Other relevant resources

- IARC - Cancer Epidemiology: Principles and Methods (http://publications.iarc.fr/Non-Series-Publications/Other-Non-Series-Publications/Cancer-Epidemiology-Principles-And-Methods-1999) Chapter 13 - Interpretation of epidemiological studies
- Field Epidemiology Manual - Selection bias (https://wiki.ecdc.europa.eu/fem/w/wiki/selection-bias)
- Sedgwick P, Sampling methods I, *BMJ* 2011;342:d1249. (http://www.bmj.com/content/342/bmj.d1249)
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- Sedgwick P, Sampling methods III, *BMJ* 2011;342:d1537. (http://www.bmj.com/content/342/bmj.d1537)

Online videos

- Online video (Statistics Learning Centre - Sampling: Simple Random, Convenience, systematic, cluster, stratified)
- Online Video (Simple Learning Pro - Types of Sampling Methods (4.1)

Expected study time: 5.5 hours

Key words

Sampling methods, Selection bias, Systematic error.

Section 9 – Systematic error in research II: Information bias (measurement error)

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail, as well as enable critical thinking on concepts pertaining to measurement, classification (including disease ascertainment) and information bias.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Critically appraise how different types of information bias could affect the validity of different study designs, and articulate strategies to avoid these.
2. Calculate, interpret and critically appraise results on sensitivity, specificity, positive and negative predictive value in published literature.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Information bias)
- Recorded PowerPoint presentation (Sensitivity and specificity of screening and diagnostic tools)

Additional learning activities to complete

- Q&A Forum (Judging on the presence of information bias)

  Description: Students are exposed to real-life examples of epidemiological studies and are asked to display critical thinking in identifying whether the methods used in these studies could potentially contribute to information bias, thus compromising study results.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapter 15 and 16.
- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapter 13.

Websites and Other relevant resources

- IARC - - Interpretation of epidemiological studies (https://www.iarc.fr/en/publications/pdfs-online/epi/cancerepi/CancerEpi-13.pdf)
- Field Epidemiology Manual - Information (measurement) bias (https://wiki.ecdc.europa.eu/fem/w/wiki/information-measurement-bias)
- BMJ – Epidemiology for the Uninitiated: Chapter 4. Measurement error and bias (http://www.bmj.com/about-bmj/resources-readers/publications/epidemiology-uninitiated/4-measurement-error-and-bias)
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Online videos

- Online video (MedCram - Sensitivity and Specificity Explained)
- Global Health with Greg Martin - Sensitivity and specificity - explained in 3 minutes (https://www.youtube.com/watch?v=FnJ3L-63Cf8)
- Healthcare Triage - Test Characteristics: How Accurate was that Test? (https://www.youtube.com/watch?v=UF1T7KzRnrs)

Expected study time: 5.5 hours

Key words

Measurement error, Classification error, Sensitivity, Specificity, Information bias, Systematic error.

Section 10 – Multi-factorial nature of disease: confounding, effect modification, and effect mediation

Learning Objectives and Outcomes

Objectives

The specific section aims to equip students with critical thinking on the multi-factorial nature of disease and the difference between confounding, effect modification (interaction) and effect mediation.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Critically appraise how the multifactorial nature of disease and the concept of confounding could affect the validity of research findings and evaluate strategies to detect and deal with it in published research studies.

2. Differentiate the concepts of confounding, effect modification (interaction) and effect mediation, and critically appraise such results from the published literature.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Introduction to Confounding: multifactorial nature of disease)

- Recorded PowerPoint presentation (Dealing with Confounding: crude and adjusted estimates)

- Recorded PowerPoint presentation (Effect modification and effect mediation)

Additional learning activities to complete

- Q&A Forum (Judging on the presence of confounding and effect modification in associations)

   Description: Students are exposed to results of epidemiological studies and are asked to display critical thinking in identifying confounding and or effect modification in these results.

- Webinar (**Mandatory Activity:** Interpreting crude and adjusted estimates from the literature)

    Description: Students are presented with two journal articles on multifactorial epidemiological associations. Students are asked to display critical thinking in identifying adjustments for confounding and whether the variables adjusted for indeed confounded the association under investigation. Through an interactive discussion students will come to appreciate the importance of identifying potential confounders, adjusting for them, and interpreting adjusted estimates in epidemiological studies.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapter 15.
- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapters 2 and 12.

Websites and Other relevant resources

- IARC - Cancer Epidemiology: Principles and Methods (http://publications.iarc.fr/Non-Series-Publications/Other-Non-Series-Publications/Cancer-Epidemiology-Principles-And-Methods-1999) Chapter 14 - Dealing with confounding in the analysis
- Field Epidemiology Manual - Confounding in Studies (https://wiki.ecdc.europa.eu/fem/w/wiki/confounding-in-studies/revision/8)
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- Pearce N. Analytical implications of epidemiological concepts of interaction. *Int J Epidemiol* 1989; 18:976–80. (https://academic.oup.com/ije/article-abstract/18/4/976/683449/Analytical-Implications-of-Epidemiological?redirectedFrom=PDF)

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- Sedgwick P, BMJ Endgames: Randomised controlled trials: understanding confounding, *BMJ* 2015; 351:h5119. (http://www.bmj.com/content/351/bmj.h5119)

- Sedgwick P, BMJ Endgames: Analysing case-control studies: adjusting for confounding, *BMJ* 2013; 346:f25. (http://www.bmj.com/content/346/bmj.f25)

Online videos

- Online video (Stata Learner - Confounding)
- Online video (EGY STAT MAN - Confounding vs Effect Modification)

Expected study time: 11 hours

Key words

Multi-factorial disease, Confounding, Effect Mediation, Effect modification, Interaction.

Section 11 – External study validity and the importance of systematic reviews and meta-analyses

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail, as well as enable critical thinking on concepts pertaining to external study validity (generalizability) and provide students an in depth analysis of the importance of systematic reviews and meta-analyses in Public Health, as well as provide the skills for using these to interpret and answer relevant Public Health questions.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Compare, contrast and differentiate the concept of external study validity (generalizability) from internal study validity, critically evaluating and explaining its importance in Public Health Policy.

2. Perform and evaluate systematic reviews, as well as interpret the results from meta-analyses (forest plots) for answering specific research questions relevant to Public Health.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Internal and External study validity)
- Recorded PowerPoint presentation (Interpreting results from systematic reviews and meta-analyses)

Additional learning activities to complete

- Webinar (Systematically searching for systematic reviews and meta-analysis in the literature)

Description: The faculty walks students through the process of searching literature to identify studies to include in systematic reviews and meta-analyses. Then, students are then instructed to navigate popular search engines to identify primary research articles as well as systematic reviews and meta-analyses.

- Q&A Forum (Judging on internal and external study validity)

Description: Students are presented with an example of an epidemiological study and are asked to interrogate the different factors influencing internal and external validity so as to make conclusions regarding the internal and external validity of the study.

Additional Support Material

Bibliography

- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapters 6 and 11.
- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapters 6 and 11.

Websites and Other relevant resources

- Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (http://www.prisma-statement.org/)
- The Cochrane Collaboration (http://www.cochrane.org/)
- The Campbell Collaboration (https://www.campbellcollaboration.org/)
- NIH - Systematic Reviews (https://nihlibrary.nih.gov/resources/subject-guides/systematic-reviews)
- NIH - Quality Assessment of Systematic Reviews and Meta-Analyses (https://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools/sr_ma)
- Agency for Healthcare Research and Quality - Methods Guide for Effectiveness and Comparative Effectiveness Reviews (https://effectivehealthcare.ahrq.gov/topics/cer-methods-guide/overview)
- Centre for Reviews and Dissemination - Systematic Reviews (https://www.york.ac.uk/crd/SysRev/!SSL!/WebHelp/SysRev3.htm)

- The National Academies of Science, Engineering, Medicine - Finding What Works in Health Care: Standards for Systematic Reviews (http://www.nationalacademies.org/hmd/Reports/2011/Finding-What-Works-in-Health-Care-Standards-for-Systematic-Reviews.aspx)

- Steckler et al, The Importance of External Validity, *Am J Public Health*. 2008 January; 98(1): 9–10. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2156062/)

- Sedgwick P, BMJ Endgames - Internal and external validity, *BMJ* 2010;340:c1705. (http://www.bmj.com/content/340/bmj.c1705)

- The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021 Mar 29;372:n71. doi: 10.1136/bmj.n71.

- Oxford Centre for Evidence-based Medicine – Levels of Evidence (http://www.cebm.net/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/)

Online videos

- Online video (Cochrane - What are Systematic Reviews?)

Expected study time: 11 hours

Key words

External Study Validity, Generalizability, Systematic review, Meta-analysis.

Section 12 – Association vs. Causation

Learning Objectives and Outcomes

Objectives

The specific section aims to equip students with critical thinking on the differences between association and causation and the importance of their distinction in Public Health Policy.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Distinguish and describe the differences between association and causation and critically appraise criteria for inferring causality for a given association.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Causality in research: association vs causation)

Additional learning activities to complete

- Discussion Forum (Critical evaluation of causality of published associations in the literature)

    Description: For this activity, students are first expected to familiarize themselves with the process of evaluating causal carcinogenic associations used by the International Agency for Research on Cancer (the IARC monographs programme). Then, in the discussion forum, they are asked to discuss the evidence and reach a conclusion regarding causality for the association between drinking coffee, mate, and very hot beverages and cancer.

- Q&A Forum (Judging on causality for a given association)

    Description: In this activity, students are presented with evidence on two associations and are asked to display critical thinking in evaluating the causality for the given associations.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapter 14.

- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapters 2 and 3.

Websites and Other relevant resources

- CDC Self-Study Course SS1978: Lesson 1 (Introduction to Epidemiology) - Section 8 (https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/section8.html)

- Field Epidemiology Manual - Causal Inference (https://wiki.ecdc.europa.eu/fem/w/wiki/79.causal-inference)

- Susser M, BMJ - Glossary: causality in public health science (http://dx.doi.org/10.1136/jech.55.6.376)

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  (http://sites.google.com/site/svenkatapuram2/krieger.pdf)

Expected study time: 11 hours

Key words

Causation, Causality, Bradford-Hill criteria.

Section 13 – Social and Environmental Determinants of Health

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail the wider determinants of health both at the national and at the global level.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Critically evaluate how social and environmental determinants (poverty, food/water availability, climate change, armed conflict) can impact on health and health inequalities, evaluate how social determinants can make individuals and communities more vulnerable to climate-related health threats and articulate the importance of the concept of environmental justice.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (The wider determinants of health)

Additional learning activities to complete

- Webinar (Social determinants of health, vulnerability to climate-related health threats and environmental justice)

  Description: Students are prompted through an interactive discussion to examine the likely impact of the social determinants of health, including within and between country inequalities, on the vulnerability of individuals and communities to the adverse health effects of climate change. The discussion will also touch why climate change is an environmental justice issue. In order to put the discussion into context, students are asked to think of and share with their colleagues examples of wider determinants and health inequalities that make their communities, or other communities in their countries, more susceptible to the adverse health impacts of climate-change.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapter 16 and 19.

- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapters 34, and 38-40

Websites and Other relevant resources

- CDC - Public Health 101 (Introduction to Public Health) (https://www.cdc.gov/publichealth101/public-health.html)

- Public Health England - Wider Determinants of Health (https://www.gov.uk/government/statistics/wider-determinants-of-health-march-2017)

- Fingertips Public Health England - Wider Determinants of Health (https://fingertips.phe.org.uk/profile/wider-determinants/data#page/0)

- WHO - The Determinants of Health (http://www.who.int/hia/evidence/doh/en/)

- WHO - Commission on Social Determinants of Health - final report (http://www.who.int/social_determinants/thecommission/finalreport/en/)

- NHS Education for Scotland - Introducing the Wider Determinants of Health (http://www.bridgingthegap.scot.nhs.uk/understanding-health-inequalities/introducing-the-wider-determinants-of-health.aspx)

- The King's Fund - The broader determinants of health (https://www.kingsfund.org.uk/time-to-think-differently/trends/broader-determinants-health)

- Institute of Health Equity - Fair Society Healthy Lives (The Marmot Review) (http://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-marmot-review)

- UCL Institute of Health Equity - Action on the Social Determinants of Health (http://www.instituteofhealthequity.org/about-our-work/action-on-the-social-determinants-of-health-)

- Mackenbach JP. Political determinants of health. *European Journal of Public Health*. 2014; 24(1). (https://doi.org/10.1093/eurpub/ckt183)

- Sundmacher L, et al., The wider determinants of inequalities in health: a decomposition analysis, *International Journal for Equity in Health,* 2011;10:30 (https://equityhealthj.biomedcentral.com/articles/10.1186/1475-9276-10-30)

- IPCC Fifth Assessment Report (AR5) – Climate Change 2014: Impacts, Adaptation, and Vulnerability (https://www.ipcc.ch/report/ar5/wg2/)

- University of California International and Area Studies – Vulnerability in Climate Change Research: A Comprehensive Conceptual Framework (https://escholarship.org/uc/item/8993z6nm)

- Environmental Justice (https://www.hhs.gov/environmental-justice/index.html)

Online videos

- Online video (WHO: Bringing health to life)

- Online video (World Health Organization - Social Determinants of Health)

- Online video (Healthy People 2020 – Determinants of Health - ODPHP)

- Online video (TED-ed - Richard Wilkinson: How economic inequality harms societies)

Expected study time: 11 hours

Key words

Wider Health Determinants, Sanitation, Water/Food availability, Safe water, Poverty, Climate change, Vulnerability, Armed conflict.

Section 14 – Principles of disease prevention

Learning Objectives and Outcomes

Objectives

The specific section aims to cover and analyse in detail the different levels of prevention and enable students design their own preventive measures for tackling current Public Health challenges.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Evaluate and apply the different levels of disease prevention (primary, secondary, tertiary) for tackling current Public Health challenges.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Principles of disease prevention)

Additional learning activities to complete

- Webinar (Important considerations for the choice of an appropriate preventive programme at all levels)

  Description: Through an interactive discussion, students are guided to appreciate the complicated process of choosing appropriate preventive programmes for Primary, Secondary and Tertiary prevention. Special focus is made on the importance of evaluation of such programmes.

- Wiki (**Mandatory Activity:** Devising efficient and cost-effective preventive programmes)

  Description: Students will be required to collectively build an essay on "Devising efficient and cost-effective preventive programmes". To put the discussion into context, two streams of discussion are put forward: Physical activity as a determinant (protective factor) of chronic non-communicable diseases and reducing the burden of mental health illness. Students can use knowledge from the section but are also encouraged to

approach the question from their point of view, contributing to the written discussion about how they would approach the problems identified. Students can interact with each other in this written discourse, disagreeing with, advancing and commenting on each other's ideas.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition)*. 2018. Chapter 5 and 18.

- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapter 9.

- Guest C, et al., Oxford Handbook of Public Health Practice (3rd edn.), Oxford University Press (2013) Chapters 3, 4.

  ➤ *Permalink for e-book*:

   http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,sso&db=nlebk&AN=615436&site=eds-live&custid=s1098328&ebv=EB&ppid=pp_Cover

Websites and Other relevant resources

- CDC - Public Health 101 (Introduction to Prevention Effectiveness) (https://www.cdc.gov/publichealth101/prevention-effectiveness.html)

- NCBI - Benefits and risks of screening tests (https://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0072602/)

- WHO - Health promotion and disease prevention through population-based interventions, including action to address social determinants and health inequity (http://www.emro.who.int/about-who/public-health-functions/health-promotion-disease-prevention.html)

- CDC – The Power of Prevention (https://www.cdc.gov/chronicdisease/pdf/2009-power-of-prevention.pdf)

- CDC - The Four Domains of Chronic Disease Prevention (https://stacks.cdc.gov/view/cdc/27508/)

Expected study time: 11 hours

Key words

Disease prevention, Primary prevention, Secondary Prevention, Tertiary Prevention, Screening.

Section 15 – Global Health Monitoring and Public Health Surveillance

Learning Objectives and Outcomes

Objectives

The specific section aims to cover the concept of public health surveillance and analyse in detail disease notification, registration and monitoring at the national and global level.

Expected learning outcomes

After the completion of this section, the students are expected to:

1. Compare and contrast the different routine notification and registration systems for vital statistics and specific diseases and the importance of disease registers.

2. Analyse the structure, organization, responsibilities and priorities of the World Health Organization (WHO), including its leadership priorities and the public health-related UN Millennium Development Goals and Sustainable Development Goals.

Teaching Material

Recorded Lectures

- Recorded PowerPoint presentation (Global Health Monitoring and Public Health Surveillance)

Additional learning activities to complete

- Webinar (Revision Support Session)

  Description: This webinar is dedicated to support students in their preparation for the final exam. The most important concepts are re-visited, but mostly, students have the opportunity to ask any questions or ask for clarifications regarding topics that have proven challenging for them.

Additional Support Material

Bibliography

- de David D Celentano ScD MHS, Moyses Szklo MD. *Gordis Epidemiology (6th Edition).* 2018. Chapter 19.
- Timothy L. Lash, Tyler J. VanderWeele, Sebastien Haneuse, Kenneth J. Rothman. *Modern Epidemiology* (4th Edition). 2022. Chapter 9.

Websites and Other relevant resources

- CDC - Public Health 101 (Introduction to Public Health Surveillance) (https://www.cdc.gov/publichealth101/surveillance.html)
- CDC Self-Study Course SS1978: Lesson 5 (Public Health Surveillance) (https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson5/index.html)
- Field Epidemiology Manual - Surveillance Principles (https://wiki.ecdc.europa.eu/fem/w/wiki/1321.surveillance-principles)
- GOV.UK – Notification of infectious diseases (NOIDS) (https://www.gov.uk/government/collections/notifications-of-infectious-diseases-noids)
- NHS Digital – Hospital Episode Statistics (http://content.digital.nhs.uk/hes)
- UCL – Health Survey for England ((https://www.ucl.ac.uk/epidemiology-health-care/research/epidemiology-and-public-health/research/health-and-social-surveys-research-group/studies-0)
- WHO - Global Health Observatory (GHO) data (http://www.who.int/gho/en/)
- WHO: The Global Guardian of Public Health (http://www.who.int/about/what-we-do/global-guardian-of-public-health.pdf)
- We Can End Poverty: Millennium Development Goals and Beyond (http://www.un.org/en/mdg/summit2010/)
- UN Sustainable Development Goals I-III (http://www.un.org/sustainabledevelopment/sustainable-development-goals/) (http://www.un.org/sustainabledevelopment/)
- European Commission – Public Health (https://ec.europa.eu/health/)
- WHO Report on Global Surveillance of Epidemic-prone Infectious Diseases (http://www.who.int/csr/resources/publications/introduction/en/index4.html)

- WHO Leadership Priorities
  (http://www.who.int/about/resources_planning/WHO_GPW12_leadership_priorities.pdf)
- UN Millennium Development Goals (http://www.un.org/millenniumgoals/)

Online videos

- Online video (WHO: Our health, our future)
- Online video (United Nations Development Programme - Transitioning from the MDGs to the SDGs)
- Online video (United Nations Foundation - A Look at the Sustainable Development Goals)
- Online video (LIDCUK - Sustainable Development Goals (SDGs) explained)
- Online video (The Global Goals - We The People' for The Global Goals)

Expected study time: 11 hours

Key words

WHO, UN, Routine Disease Notification, Disease registers, Public Health Surveillance.

Assessment

This course is assessed via a combination of attendance and participation in webinars and mandatory interactive activities (comprising 10% of total course marks), coursework (comprising 40% of total course marks) and a final comprehensive examination (comprising 60% of total course marks). In addition, the students will have the opportunity to undergo formative assessment, as a means of familiarising with the summative examination, as well as evaluating their performance in the course and receiving feedback from the course's tutor(s).

Participation and engagement in webinars and mandatory interactive activities

The Participation Grade will constitute 10% of the *total course marks* and will be awarded based on i) webinar attendance and active participation and ii) participation in five (5) learning activities. Participation includes active engagement in synchronous activitives, such as webinars, and online chats; and/or successful completion of mandatory in-course interactive activities, such as discussion fora, Q&A fora, short quizzes and problem-solving scenaria. The mandatory interactive activities that will be used for this course are clearly stated under each section of this study guide.

Coursework

The MPH-511 course comprises of the one assignment consisting of the following: <u>Oral presentation to an academic audience</u> on critical evaluation of a published article/research study in the field of Epidemiology and Public Health (*30% of total course marks*).

Detailed information and guidelines on the above coursework components will be uploaded on the course's Moodle page. All coursework will be submitted via Moodle and marks will be communicated to students electronically. Dedicated Assignment Support Webinars will be offered prior to the submission of each assignment, with the purpose of answering student questions relevant to the content of the assignment, as well as the submission process.

Final Examination

The MPH-511 final examination is a comprehensive exam assessing the specific learning outcomes (LOs) from all course sections. Since the exam is constructed explicitly based on the course's learning outcomes, students are strongly advised to follow an LO-driven approach while revising and preparing for the final examination. Students should be expected to be able to answer a given question on any LO covered during the course.

Final examinations will be completed online using electronic invigilation software.

Formative quiz and feedback

Students will have the opportunity to attempt a formative quiz, which although not contributing to the course's total marks (i.e. formative), is compulsory. The purpose of the formative quiz is for students to: (a) evaluate their performance and understanding/assimilation of the learning material up to the point of the quiz; (b) familiarize themselves with the level and format of the course's exams; and (c) receive valuable feedback from the course tutor(s) on their performance, as well as guidance on how to improve. The formative quiz will be conducted via Moodle.

Self-assessment exercises

Short Answer Question (SAQ)

A team of researchers conducted a cohort study to investigate the association between obesity and breast cancer among a sample of middle-aged women.

a) Outline briefly, **in 5 simple steps**, how the researchers would have designed and conducted this cohort study. The steps you outline need to be in the correct sequence, i.e. as they would have actually taken place in the study. **(5 marks)**

b) What action would the researchers take in order to minimize confounding during the analysis of the data? **(1 mark)**

c) Give the **two main reasons** the researchers chose a cohort design rather than any other study design for investigating the specific research question. **(2 marks)**

d) Give **two disadvantages** of cohort studies. **(2 marks)**

SAQ Model Answer:

a) Step 1: Recruit a random sample of middle-aged individuals from the source population **[1 mark].**

Step 2: Exclude from the sample all individuals who have the disease of interest (breast cancer) **[1 mark].**

Step 3: Assess the exposure of interest (obesity) in all participants **[1 mark].**

Step 4: Follow-up participants over a set period (many years in this case) and record incidence (risk) of the outcome (breast cancer) **[1 mark].**

Step 5: Compare risk of outcome in exposed (obese) and unexposed (non-obese) by calculating a measure of association (Risk Ratio) **[1 mark].**

Note on marking: For step 5, if measure of association stated but Risk Ratio not specified then **full marks.** If other relevant measure of association reported (i.e. Rate Ratio), then **full marks**. If Odds Ratio stated then **1/2 mark**. If irrelevant measure of association stated (i.e. mean difference, regression coefficient, etc.), then **no marks**.

b) Statistical adjustment for potential confounders **[1 mark].**

c) A cohort study is suitable as it can clearly show a temporal association between exposure and outcome **[1 mark].**

With a cohort study we can calculate incidence (risk) of disease and thus identify factors that alter disease risk **[1 mark].**

Note on marking: Additional answer for (c) Cohort studies are less prone to recall bias compared to case-control studies **[1 mark].**

d) Prone to selection bias if the sample does not represent the source population.

Prone to information bias if key factors are based on self-reports.

Prone to confounding.

Cannot prove causality.

Very expensive to conduct. Require a very long duration of time, so not very practical to conduct.

Any combination of two from the above list [**2 marks**].

Single Best Answer (SBA) question

A cross-sectional study investigated the association between consumption of beer and central obesity (waist circumference). The results are presented in Table 1 below.

Table 1. Estimates for the association between beer consumption and waist circumference.

Consumption of beer	Mean difference in waist circumference (compared to never)
Never	Reference
<1 pint per week	2.90 cm
1-7 pints per week	4.15 cm
>7 pints per week	6.40 cm

Based on the information available to you, which major Bradford Hill criterion for causality is fulfilled in the current study?

A. **Biological gradient.**
B. Consistency.
C. Temporality.
D. Reversibility.
E. Specificity.

SBA notes on answer options:

A. Biological gradient. Correct answer. As beer consumption increases, waist circumference increases linearly.

B. Consistency. Wrong answer. Consistency is all about repeatedly observing this association in the literature. Not able to determine this from a single study.

C. **Temporality**. Wrong answer. Temporality is about proving a temporal association between exposure and outcome. In the example above, we have a cross-sectional study, thus temporality is not fulfilled.

D. Reversibility. Wrong answer. Reversibility is all about reversing/reducing the outcome by removing/reducing the exposure. We do not have such information from the example above.

E. Specificity. Wrong answer. Specificity is about having an exposure which always leads to the outcome. This is not the case here, as high beer/alcohol consumption is involved in other conditions in addition to obesity.